[0001] This invention relates to a method and system for introducing a predetermined amount of a force compensating material into a wheel/tire assembly for [counteracting] equalizing radial and lateral force variations at the tire/road footprint of a pneumatic tire.

Please insert the following new paragraphs after paragraph [0005].

[0005.1] The applicant's U.S. Patent 6,249,971, entitled Method and System for Tire/Wheel Disturbance Compensation, which is hereby incorporated by reference describes such an approach to disturbance compensation. This approach is briefly described with reference to prior art FIG. 4 which illustrates the innumerable radial impact forces (Fn) which continuously react between the road R and the tread T at the lower portion or footprint B during tire/wheel assembly rotation. There are an infinite number of such forces Fn at virtually an infinite number of locations (Pn) across the lateral width W and the length L of the footprint B, and FIG. 4 diagrammatically illustrate five such impact forces F1-F5 at respective locations P1-P5. It is assumed that the forces F1-F5 are different from each other because of such factors as tire wear at the specific impact force location, the road condition at each impact force location, the load upon each tire/wheel assembly, etc. Thus, the least impact force is the force F1 at location P1 whereas the greatest impact force is the force F2 at location P2. Once again, these forces F1-F5 are merely exemplary of innumerable/infinite forces laterally across the tire 11 between the sidewalls SW1 and SW2 and circumferentially along the tire interior I which are created continuously and which vary as the tire/wheel assembly 10 rotates.

[0005.2] As these impact forces are generated during tire/wheel assembly rotation, the material 20 is adapted to relocate in dependency upon the location and the severity of the impact forces Fn. In the preferred embodiment, material 20 is a composition of dry, solid particles, wherein relocation of the particle mixture 20 through movement of the individual granules, powder and dust is also inversely related to the magnitude of the impact forces. For example, the greatest force F1 is at position P1, and due to these greater forces F1, the particle mixture 20 is forced away from the point P1 with the least amount of the particle mixture remaining at the point P1 because the load force there is the highest. Contrarily, the impact force F is the lowest at the impact force location point P2 and therefor more of the particle mixture 20 will remain there. In other words, at points of maximum or greatest impact forces (F1 in the example), the quantity of the particle mixture 20 is the least, whereas at points of minimum force impact (point P2 in the example), the quantity of particle mixture 20 is proportionately increased. This movement of material creates lift, thereby substantially equalizing the radial and lateral force variations. Accordingly, the vibrations or impact forces Fn force the particle mixture 20 to continuously move away from the higher or excessive impact areas F1 or areas of maximum imbalance F1 and toward the areas of minimum impact forces or imbalance F2. The particle mixture 20 is moved by these impact forces Fn both laterally and circumferentially, but if a single force and a single granule of the particle mixture 20 could be isolated, so to speak, from the standpoint of cause and effect, a single granule located at a point of maximum impact force Fn would be theoretically moved 180 degrees therefrom. Essentially, with an adequate quantity of particle mixture 20, the variable forces Fn create through the impact thereof a lifting effect within the tire interior I which equalizes the radial force variation applied against the footprint until there is a total force equalization circumferentially and laterally of the complete tire/wheel

assembly 10. Thus the rolling forces created by the rotation of the tire/wheel assembly 10 in effect create the energy or force Fn which is utilized to locate the particle mixture 20 to achieve lift and force equalization and assure a smooth ride. Furthermore, due to the characteristics of the particle mixture 20, road resonance is absorbed as the tire/wheel assemblies 10 rotate.

Please amend paragraph [0006] as shown:

[0006] While the use of a compensating material introduced into the interior of the tire has been found to work effectively, either alone or in combination with other balancing techniques, a limitation has been found in how to introduce this material into the tire. In the prior approaches, [the] as depicted in FIG. 3, pulverulent material 20 deposited in mound M is suspended in an air stream and introduced into a tire through a hose line (not shown) and valve stem 14 of tire valve 13 used for inflation of a tire 11. Although such an approach works sufficiently, this method of delivery of a compensating material is in some instances an inconvenient delivery method, and may result in contamination of a work place where a wheel assembly is being balanced. This delivery system has further been utilized in the aftermarket environment to facilitate balancing of replacement tires, and no effective approach to introducing such material into a tire/wheel assembly at original manufacture has been provided.

Please amend paragraph [0033] as shown.

[0033] The particles must have a specific gravity greater than 1 so that they will move positively and as quickly as possible from one place to another in response to external force. It

has also been found that the addition of dry powder lubricant or anti-agglomerating agents can significantly increase the effectiveness of the principal particulate material. The dry lubricant acts to coat the interior surface of the tire as well as the primary particulate material particles. In this way particle-particle friction of the particulate material is reduced as is friction at the particulate particle-tire surface interface. The reduced friction allows the particulate material to respond more quickly in [counteracting] <u>equalizing</u> radial and lateral forces acting on the vehicle wheel assembly.

Please amend paragraph [0034] as shown.

[0034] When present in a sufficient amount the dry lubricant serves as a vehicle within which the pulverulent material may freely flow or move laterally and circumferentially within the tire. Further due to the extremely fine particle size of the lubricant, quantities of the lubricant itself may quickly move to positions within the tire in order to [counteract] <u>equalize</u> radial and lateral forces acting on the vehicle wheel assembly. Other anti-agglomerating agents to function in this manner are also contemplated.

Please amend paragraph [0038] as shown.

[0038] In order to introduce wheel [balancing] <u>compensating</u> material in the form of agglomerates into a tire in an amount sufficient to [balance] <u>equalize radial and lateral forces of</u> a wheel assembly, it is necessary to introduce at least one self-contained batch, and it may be necessary to introduce more than one self-contained batch, as in the form of pellets, or a single

self-contained batch, as in the form of a briquette 30. A self-contained batch is preferably sized such that it may be introduced into a tire as one batch (such as a briquette) or in a plurality of batches (such as pellets). The number of self-contained batches required to provide the desired compensation of radial and lateral force variations at the tire/road footprint will in turn be dependent on the characteristics of the tire/wheel assembly 10 as well as the characteristics of the vehicle on which the assembly is to be used. For example, the amount of compensating material required to provide the desired compensation function will increase as the size of the tire increases and as the gross vehicle weight increases. Further, it may be determined that a tire is imbalanced to a certain extent which would require a greater amount of compensating material. Other characteristics of a tire/wheel assembly, such as non-uniformity may also vary the amount of compensating material required. Thus, according to the invention, the self-contained batches of material may be formed in a variety of predetermined sizes to allow the desired amount of material to be easily chosen and introduced into the tire of a particular tire/wheel/vehicle combination simply and effectively. In general, the preferred amount of the preferred compensating material for passenger and light truck vehicles is in a range of 0.20-2.0 ounces while larger vehicles may use a larger amount, such as between 1.5-24 ounces. These amounts may vary depending on particular characteristics of the tire/wheel/vehicle. More particularly, the following ranges of the preferred compensating material are generally found to be effective for the following tire sizes. For a 13" tire/wheel, an amount of compensating material for incorporation therein may range from about 0.2-0.6 ounces. A 14" tire/wheel may require an amount of compensating material in the range from about 0.4-0.9 ounces, while a 15" tire/wheel may require between 0.8-1.4 ounces. For a 16" tire/wheel, the amount of compensating material that may be required may range from about 1.0-1.7 ounces, while a 17" tire/wheel may require

an amount in the range from about 1.2-2.0 ounces. For truck tires, the amount of compensating material that would be desired for compensating radial and lateral force variations may lie in the range between 2.0-6.0 ounces. Again, depending on the material itself as well as the characteristics of the tire/wheel/vehicle, the amount of material desired may vary. In general, the amount of material is sufficient to balance a wheel assembly and compensate for radial and lateral force variations at the footprint. Thus, as tires of any size, ranging from passenger car tires to truck tires, can be treated with a composition according to this invention for the purpose of balancing a wheel assembly and/or equalizing load forces. The amount (or weight) of powdered material per tire to be used will vary over a wide range, depending on the size of the tire and the amount that the tire is out of balance, whether this amount be expressed as a suitable range or as an optimum amount. A suitable amount of material to be used can be determined empirically, and indeed may require determination empirically, since the amount that a tire is out of balance is determined empirically.

Please amend paragraph [0045] as shown.

[0045] The compositions above described may be formed by known procedures. Pellets, briquettes and other agglomerates or extrudates according to this invention may be made of any convenient size and shape. Pellets are typically either spherical or ellipsoidal. Briquettes are typically pillow shaped as shown in Fig. 5. Extrudates are typically cylindrical. None of these shapes is critical. Size also is not critical, except that an agglomerate should be no larger than is necessary to contain wheel [balancing] <u>compensating</u> material sufficient to charge a given tire

size using one self-contained batch. An agglomerate can be small enough to permit charging of a plurality of self-contained batches.

Please amend paragraph [0046] as shown.

[0046] In another embodiment as shown in Fig. 6, a self-contained batch of particulate wheel [balancing] <u>compensating</u> material is made in the form of a bag 40 containing free flowing compensating material. A bag is also suitable as a self-containment form for liquid and liquid/solid materials. A bag is preferably made of a material that will abrade, tear or shred upon rotation of an assembled wheel. Suitable materials include generally paper and plastic. In Fig. 6, the bag 40 is designed to contain a predetermined amount of compensating material to allow shipping, handling and charging of a tire/wheel assembly without substantial loss of material, and then to break down to release the free-flowing particles or other material. In an embodiment of bag 40, a paper material may be used to form bag 40 in a conventional manner using form, fill and seal equipment. In such equipment, bag 40 is produced with an initially open top, the compensating material is placed therein, and the top is then sealed. In a particular example, a 20 lb. paper was used to form bag 40, with the edges thereof hot sealed using a 5 lb. low density polyethylene glue. Other paper weights or glues may also be suitable for a given tire/wheel assembly. Thus a bag of compensating material is self-contained in that it will retain substantially all of the material batch in the bag until the bag is transferred into a tire.

Please amend paragraph [0048] as shown.

[0048] In a further embodiment of a self-contained batch using a container such as a bag 40 for the free-flowing material, may also use perforations 48 in the bag material (whether paper or polymeric) if desired, to facilitate shredding of the bag 40 and release of the compensating material. Such perforations can be formed using conventional perforating equipment. It should be understood that any such perforations would have to be of a character to not allow the escape of material from within the bag 40 until bag 40 has been charged into a tire. The perforations, or microperforations, if any, are sufficiently small to prevent loss of wheel [balancing] <u>compensating</u> material through the perforation holes, but also facilitate shredding of the bag 40 upon rotation of the tire.

In the Claims:

Please delete claims 9, 16-20 without bias or prejudice to the subject matter contained therein.

Please amend the claims as follows:

1. (Amended) A method for introducing a compensating material into a tire/wheel assembly comprising the steps of:

providing a tire;

providing at least one [self-contained batch] <u>bag</u> of compensating material;

transferring said at least one [self-contained batch] <u>bag</u> of compensating material into an interior of said tire; and

mounting said tire on a wheel to form a tire/wheel assembly;